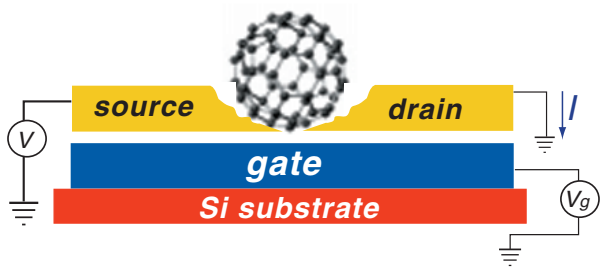
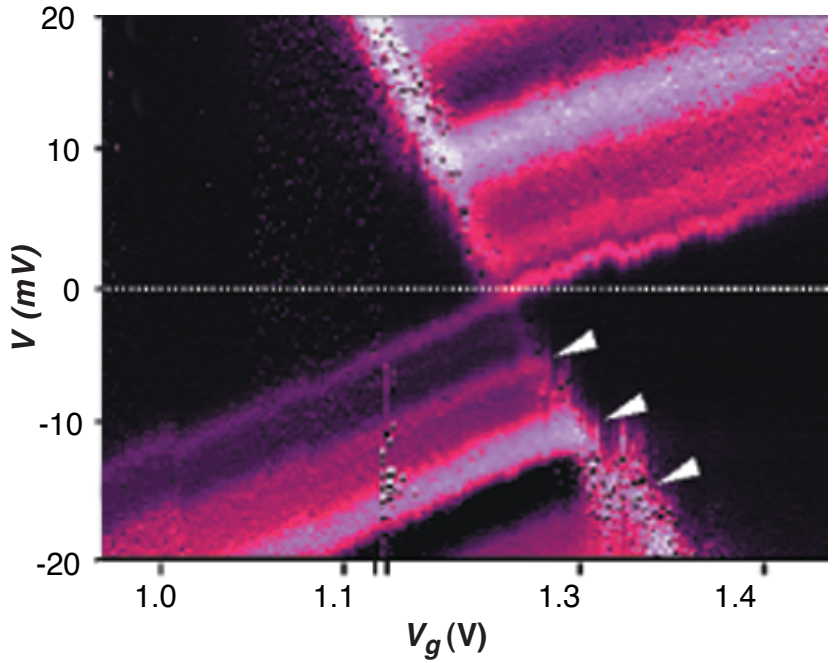
First Single Molecule, C_{60} Nanotransistor Frabricated

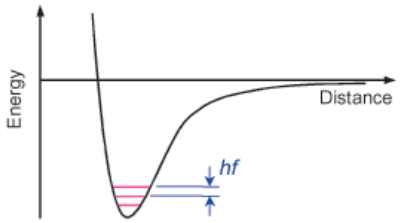
"Bouncing Ball" Oscillations Observed, Coupling Electrical and Mechanical Motion

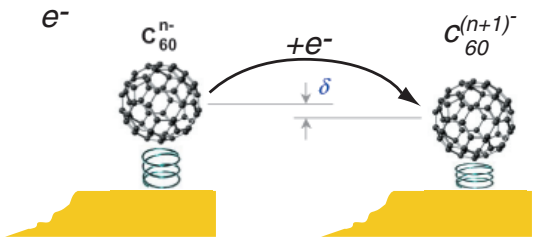


Electron beam lithography at the MSD "Nanowriter" *facility is used to make source and drain contacts with a 1 nm gap designed to accept single C_{60} molecules. An insulating SiO_2 layer on the Si substrate forms the gate contact.*



Conductance (color intensity) as a function of source-drain voltage (y-axis) and gate voltage (x-axis). *Those straight lines that are indicated by white arrows reveal presence of a quantum mechanical excitation coupled to the electron motion. The characteristic energy of of the vibration is 5 meV.*





Modeling of the motion of a C_{60} molecule *between the transistor contacts as a simple harmonic oscillator (top) yields a predicted vibrational quantum of 5 meV. Coupling of this motion to the motion of single electrons (bottom) leads to the features in the conductance plots shown at left.*

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